

Applications of ^{14}C Ground-water Dating in Hydrologic and Geochemical Studies of the Regional Aquifer, Pajarito Plateau, New Mexico

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Michael Dale¹, Kim Granzow¹, and Patrick Longmire²

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¹ NM Environment Department, DOE Oversight Bureau

² Los Alamos National Laboratory

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Motivation of Study

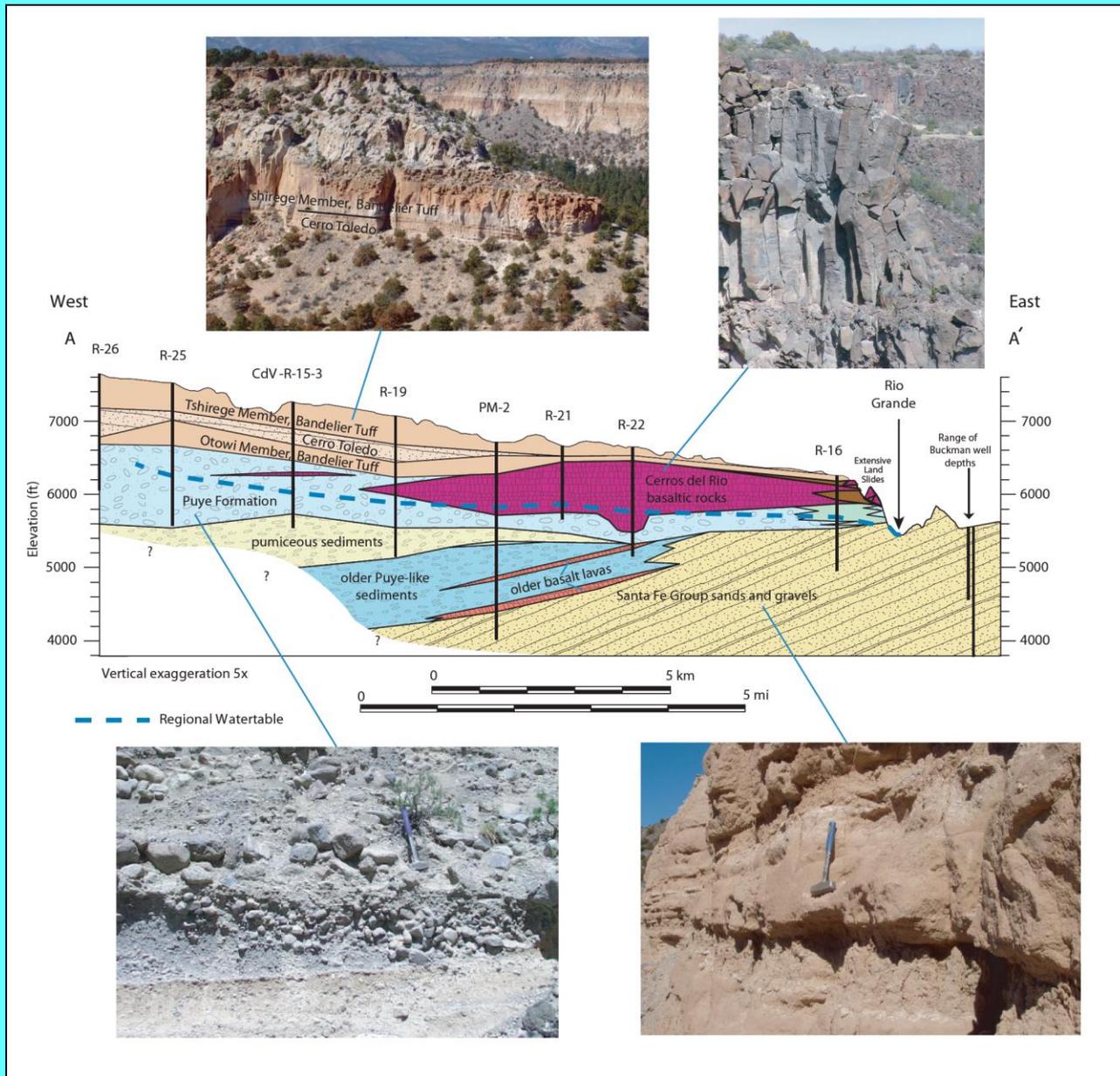
Establish an understanding of the ground-water flow system at Los Alamos (water sources, ages and travel times, mixing relations, and flow paths) that is independent of numerical models.

This understanding can be used either to guide the development or evaluation of results of corresponding flow models.

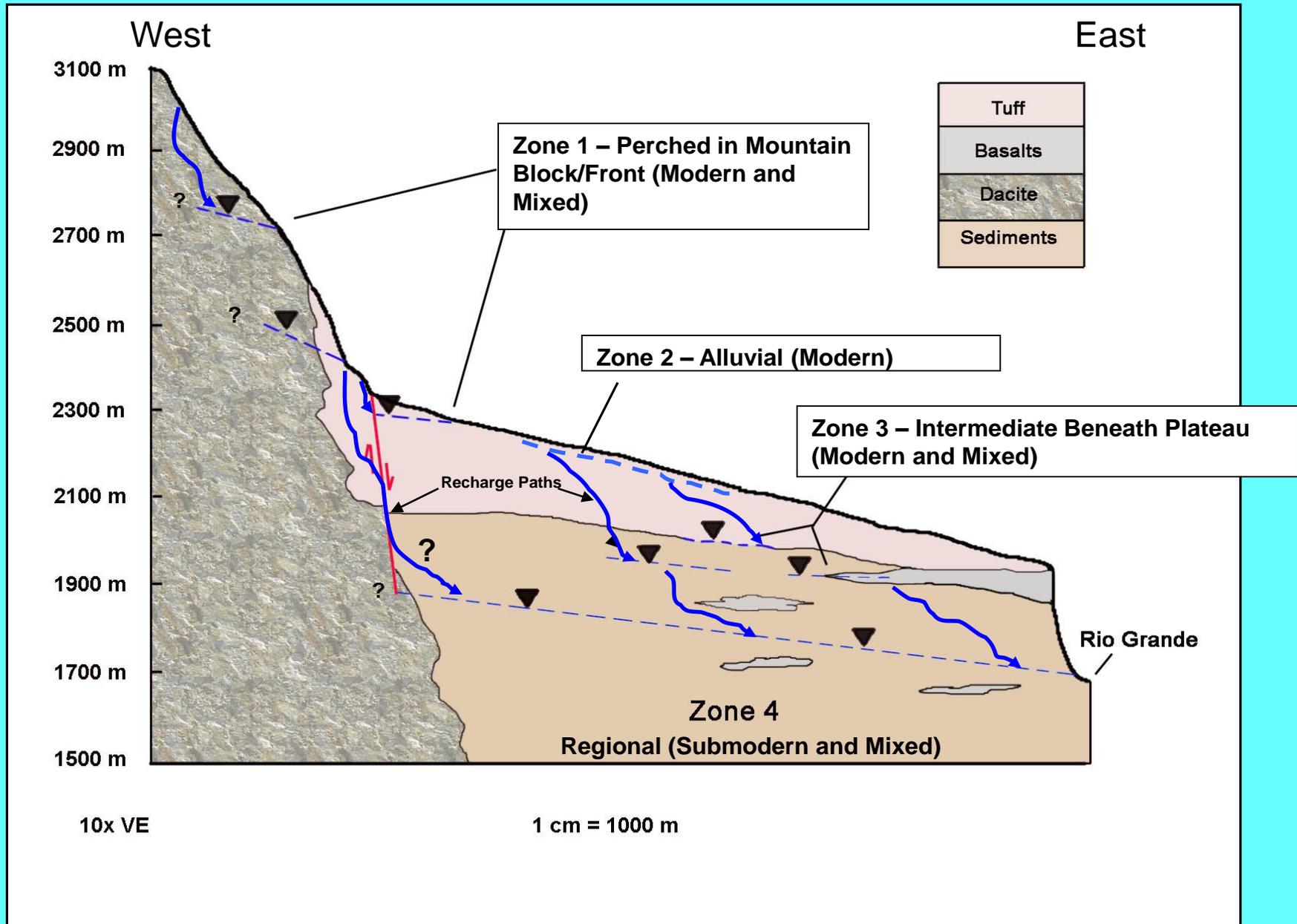
Analytical Methods

- **Carbon-14**, accelerator mass spectrometry
- **Tritium**, helium ingrowth and electrolytic enrichment
- **Stable isotopes**, isotope ratio mass spectrometry
- **Anions**, ion chromatography
- **Metals**, inductively couple (argon) plasma-optical emission spectroscopy (ICP-OES) and inductively couple (argon) plasma-mass spectrometry (ICP-MS)
- **Total carbonate alkalinity**, titration

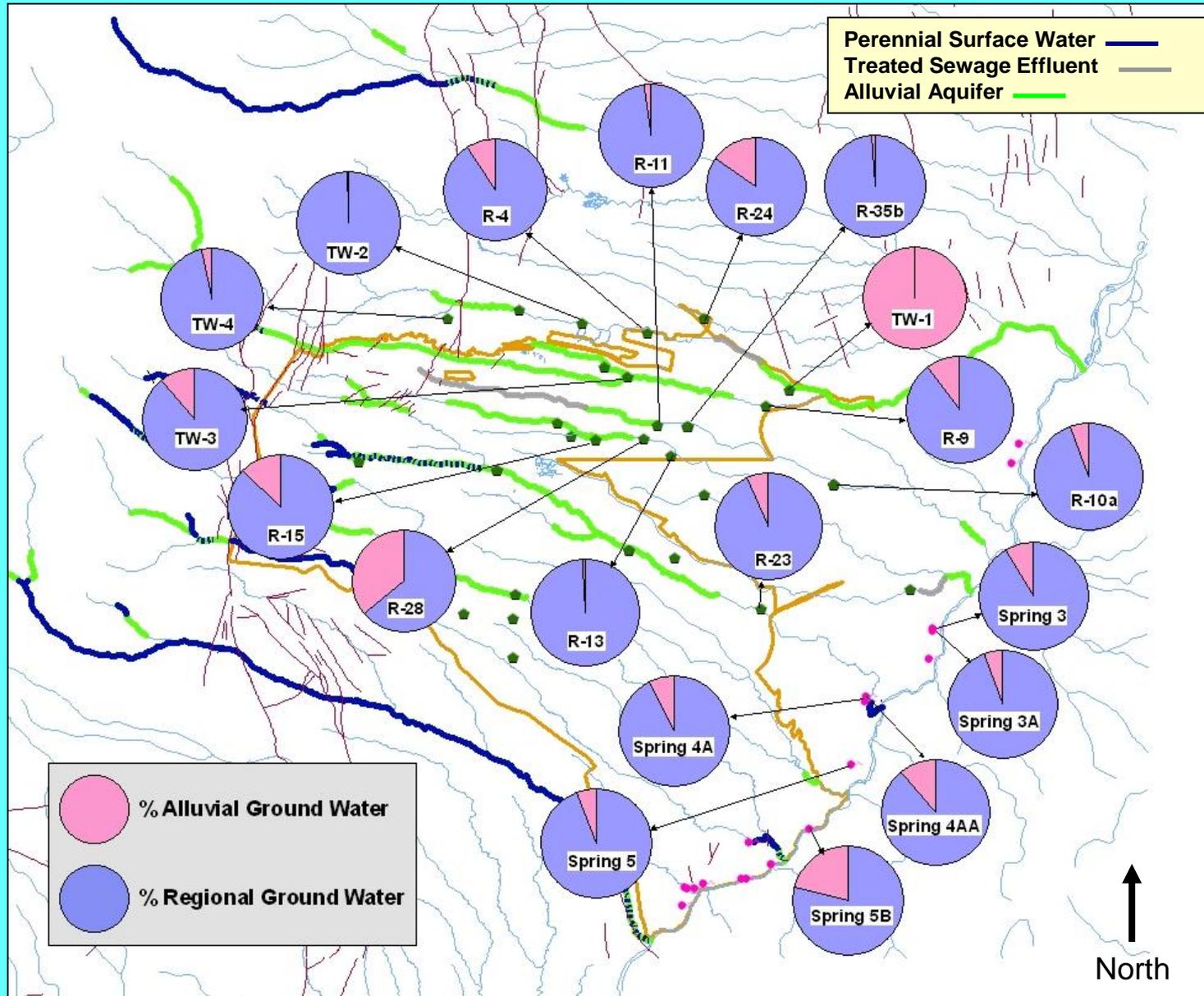
LANL Stratigraphy



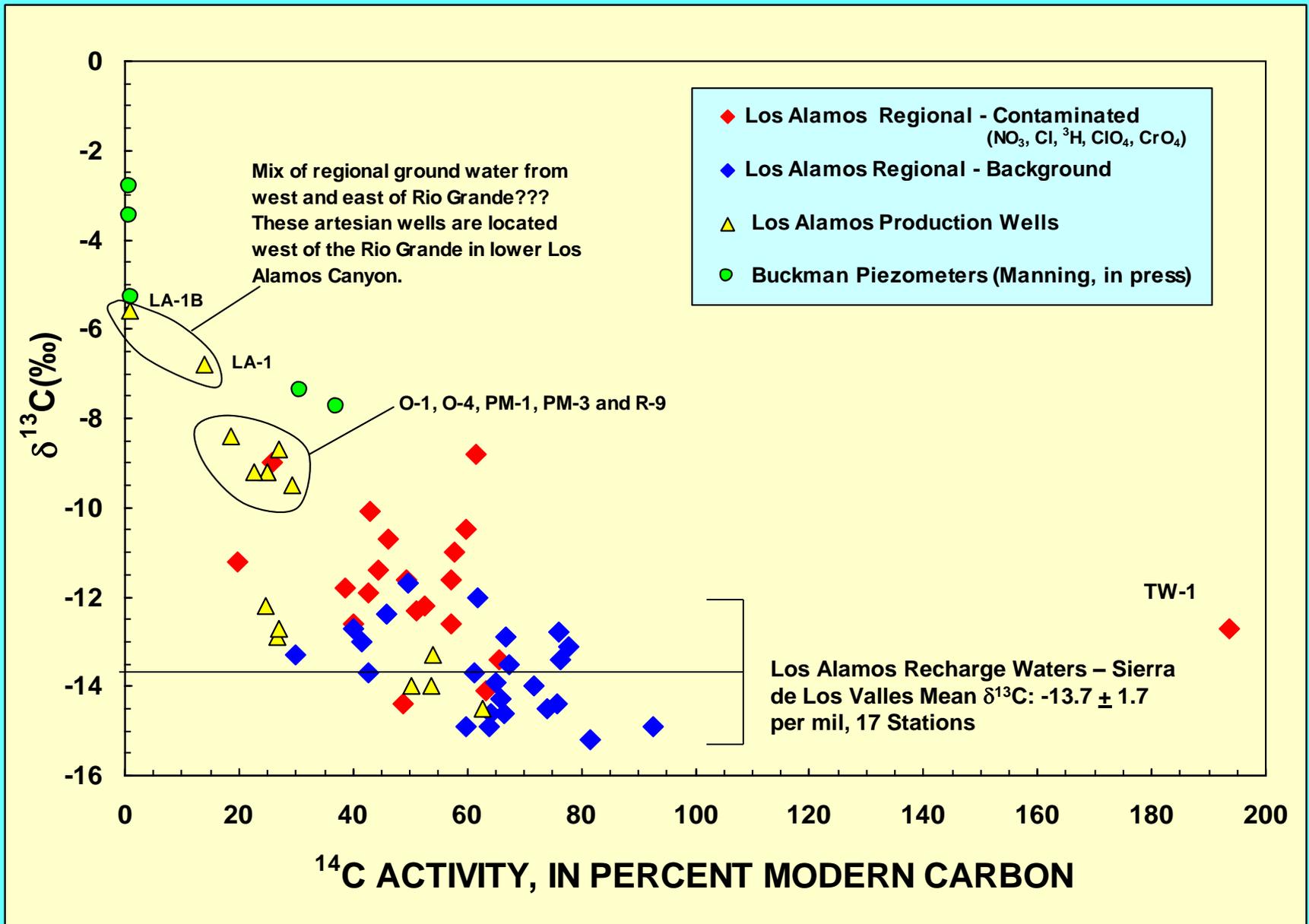
Generalized Cross Section Showing Ground-water Type and Expected Trends in Ground-water Age for Conceptual Model of Ground-water Flow



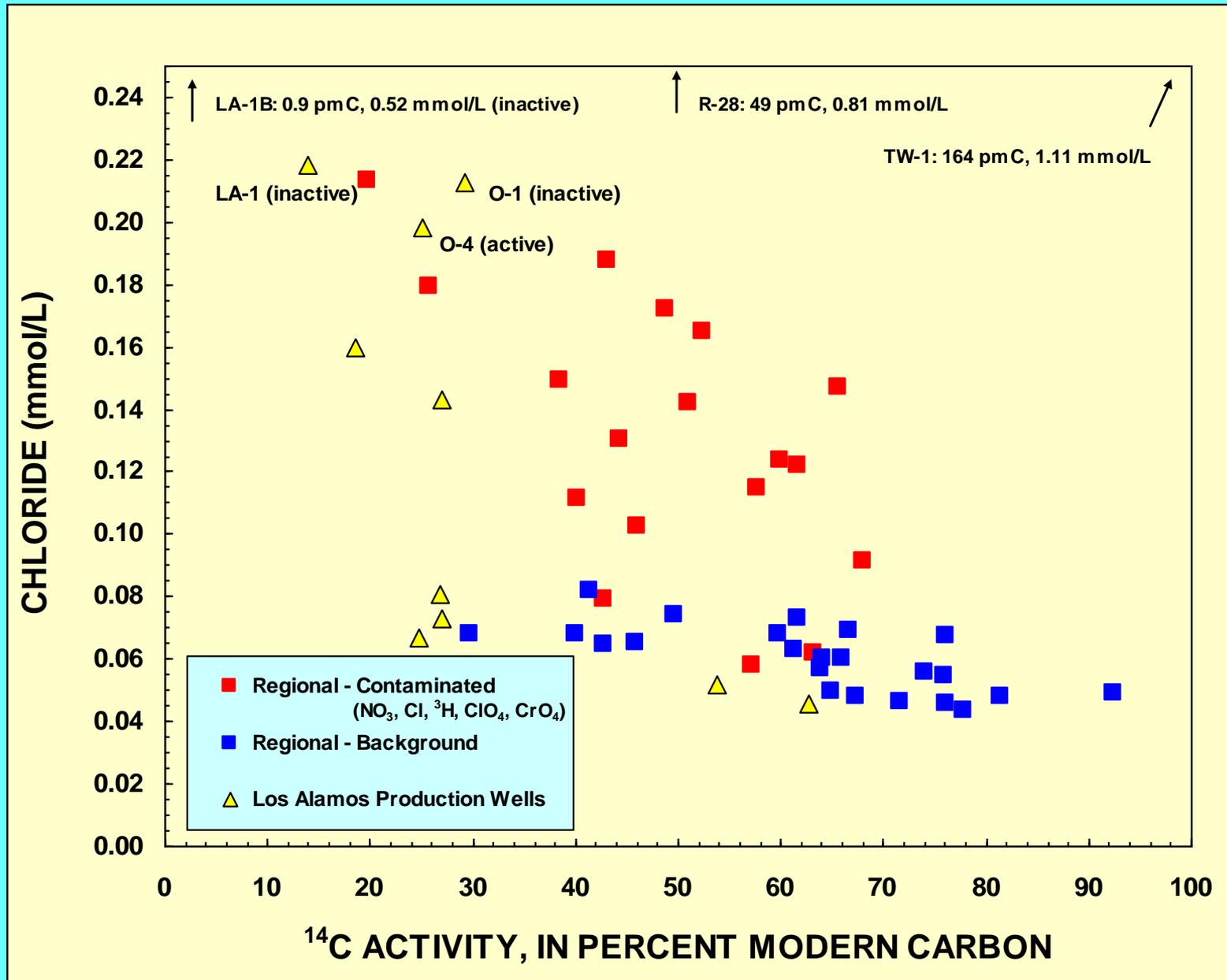
Average Mixing Ratios for the Regional Aquifer Containing Chloride from Alluvial Ground Water, Pajarito Plateau, New Mexico



Carbon-14 (Percent Modern Carbon) Versus $\delta^{13}\text{C}$, Pajarito Plateau and Surrounding Area, New Mexico



Carbon-14 (Percent Modern Carbon) Versus Chloride (mmol/L), Los Alamos, New Mexico



Summary and Conclusions

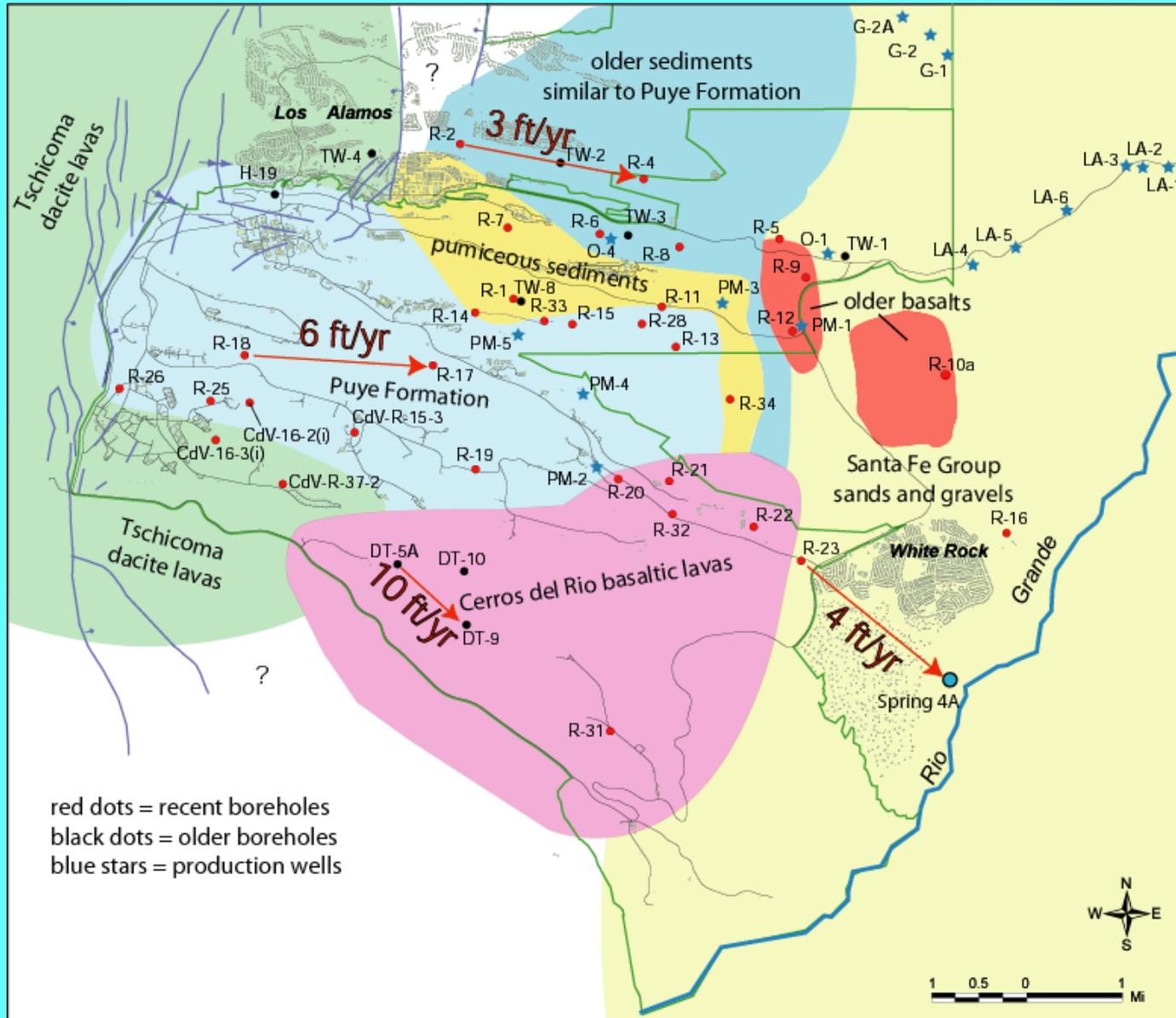
- **The regional aquifer consists of submodern (pre-1943) or mixed (pre- and post-1943) ages.**
- **Submodern-ground water is common in the regional aquifer. Average ages for the regional aquifer range from 570 to 13,005 years based on unadjusted ^{14}C results.**

Summary and Conclusions

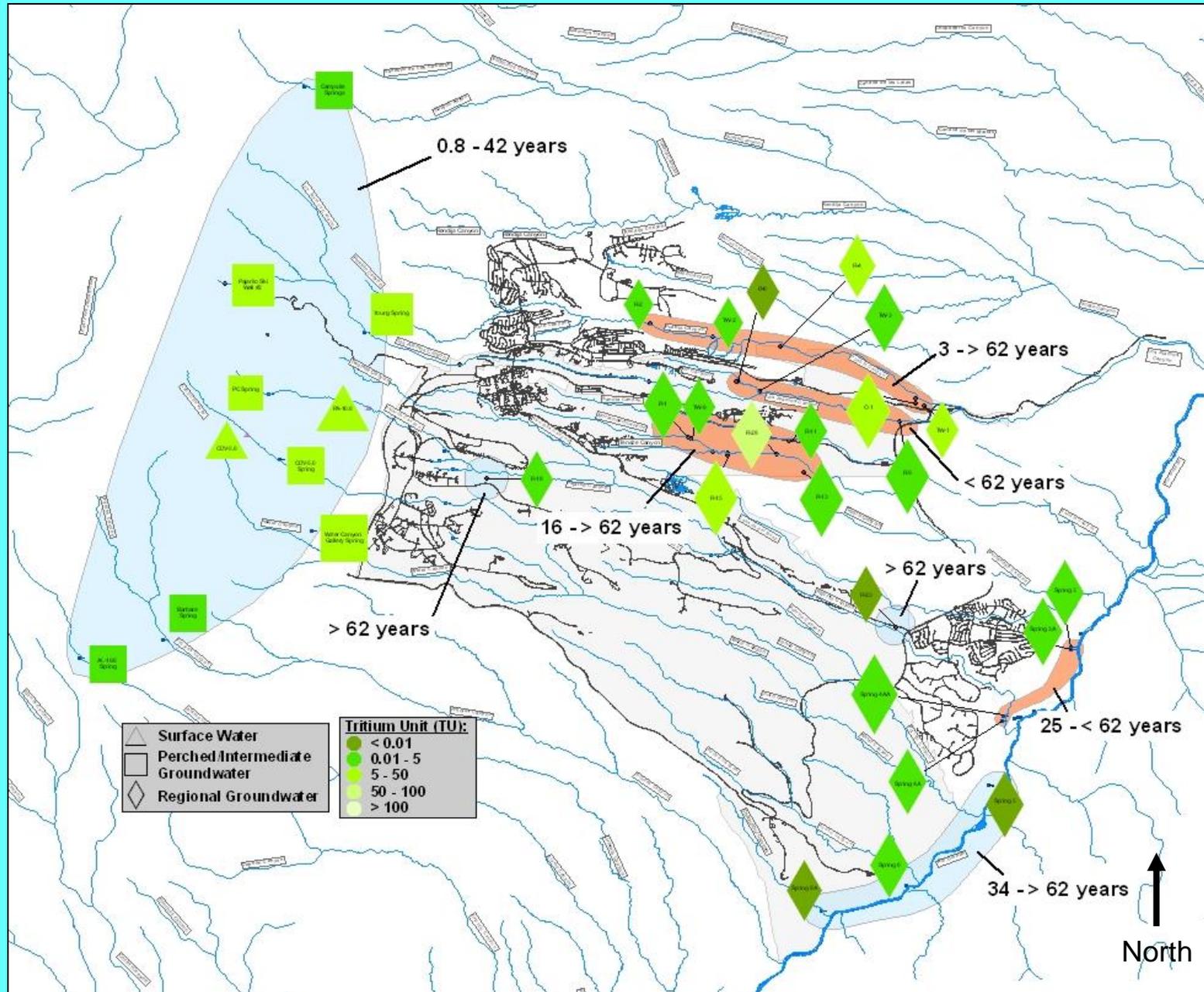
- **Variations in unadjusted ^{14}C ages for the regional aquifer result from sources of recharge water, mixing of waters, and hydraulic properties of the aquifer material.**
- **Application of ^{14}C ages with mobile chemicals such as chloride define preferred ground-water flow paths within the regional aquifer.**
- **The next step in this work will be to apply these unadjusted ^{14}C ages as constraints to hydrologic flow and transport models and as input to geochemical models.**

Supplemental Material

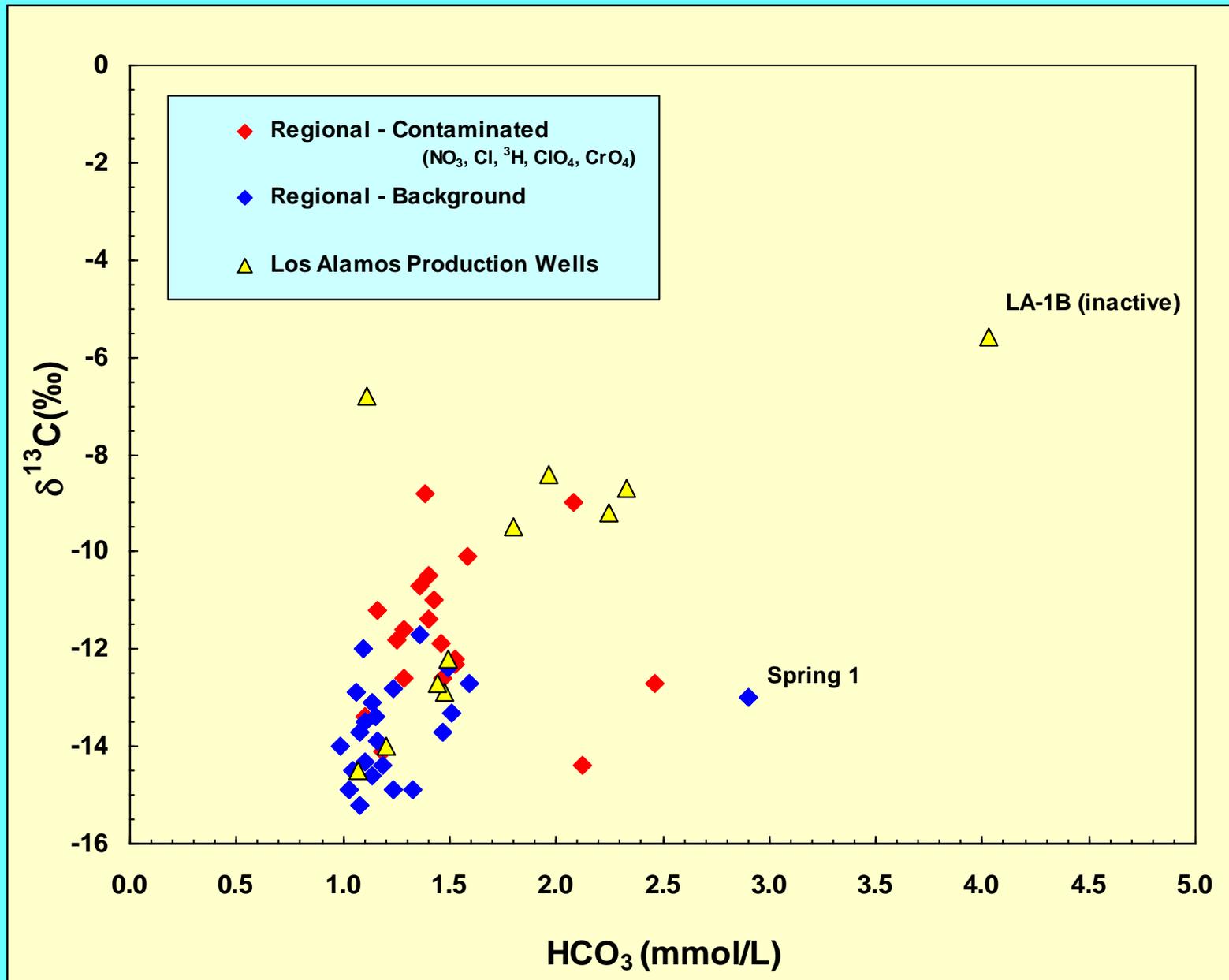
Average Ground-Water Flow Rates Near the Regional Water Table, Based on Unadjusted ^{14}C Ages, Pajarito Plateau, New Mexico



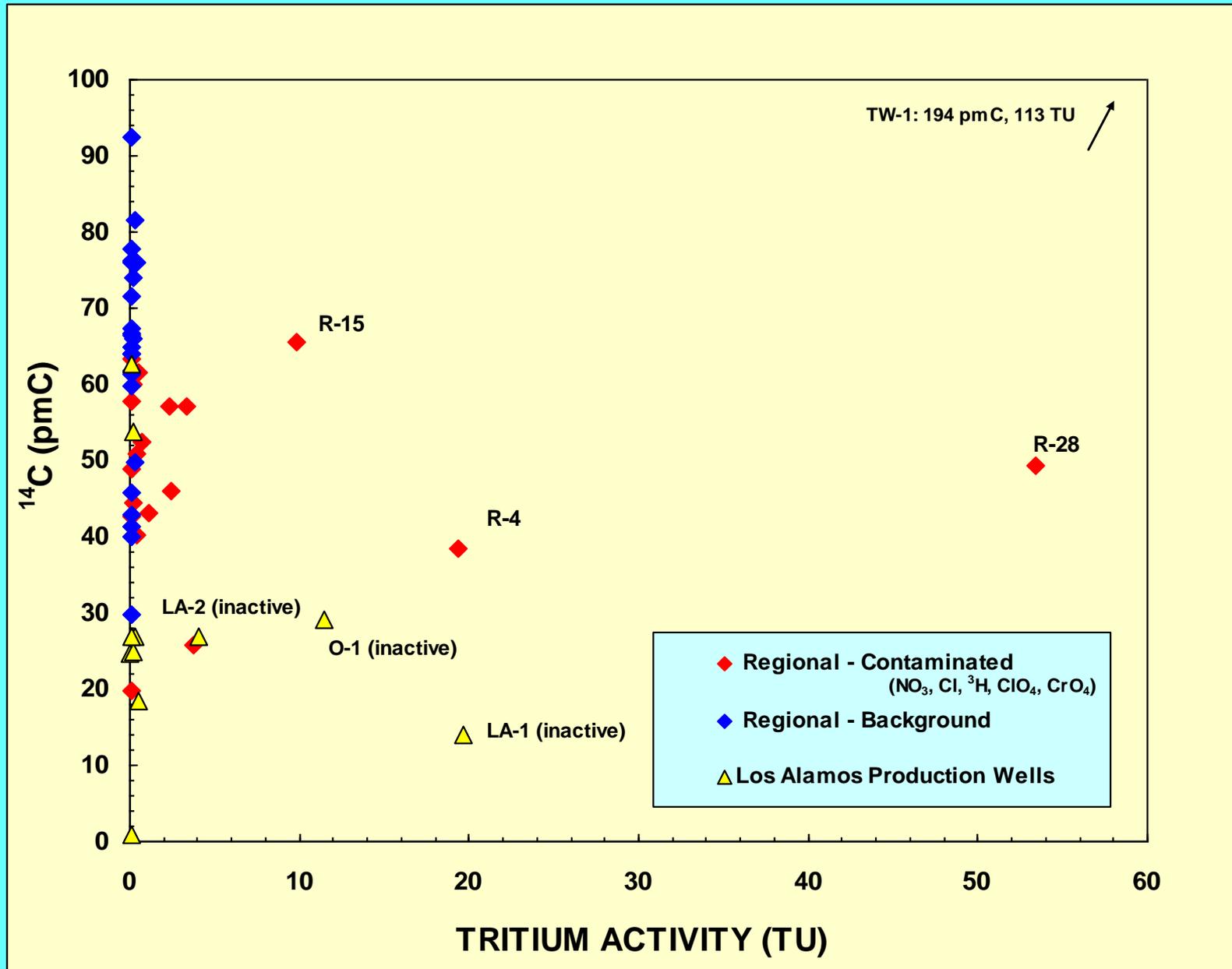
Ranges of Apparent $^3\text{H}/^3\text{He}$ Ages in the Regional Aquifer



Bicarbonate (mmol/L) Versus $\delta^{13}\text{C}$ (per mil), Los Alamos, New Mexico



Carbon-14 (Percent Modern Carbon) Versus Tritium (TU), Los Alamos, New Mexico



Tritium (TU) Versus Chloride (mmol/L), Los Alamos, New Mexico

